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DISPERSED COMMUNITIES AND DIVERSE STRATEGIES: LATE NEOLITHIC ECONOMY ON THE POLISH LOWLAND (3500−2500 BC)

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This paper intends to explore various aspects of the economic archaeology of Late Neolithic communities, including the production, distribution and consumption of food and goods. The area of reference is the western part of the Polish Lowland located between the Vistula, Oder, Noteć and Warta rivers. The stage of prehistory referred to covers the period of 3500 to 2500 cal BC. The beginning of the period is marked by the rise of Late Neolithic settlement structures, social organisation and economic strategies on the Lowland, while the end of the period under study coincides with their re-organisation.

INTRODUCTION

From c. 3500 BC onwards, one of the most distinctive characteristics of the Polish Lowland was the variety of cultural traditions which are known in archaeological terminology as the Funnel Beaker culture (FBC), phases IIIB (in part), IIIC, IV and V (Czebreszuk et al. 2000, Przybył 2009), the Globular Amphora culture (GAC), phases I−IIIb (Szmyt 1996, Szmyt 2000) and the Corded Ware culture (CWC), phases CWC1−CWC4 (Czebreszuk 2001). During the Late Neolithic, so−called Subneolithic groups also lived in the area in question (Kobusiewicz and Kabaciński 1993, Józwiak 2003).

Within the Polish Lowland, one can find very diverse landscapes and soils: lakelands, large valleys with a peaty floor, sandy and clay areas (in the FAO−UNESCO glossary: *cambic arenosols*, *cambic podzols*, *luvisols* etc.) and plains with very fertile so−called black soils (*mollic gleysols*, *gleyic phaeozems*). The latter forming ‘fertile islands’ (Fig. 1): they are large (approx. 845 km^2 in the Kujawy region), smaller (100−300 km^2 in the Września or Kościan district) or very small (approx. 80 km^2 in the Szamotuły district). The history of agriculture in the Lowland began in these areas and they have been used intensively for human settlement for hundreds or even thousands of years.

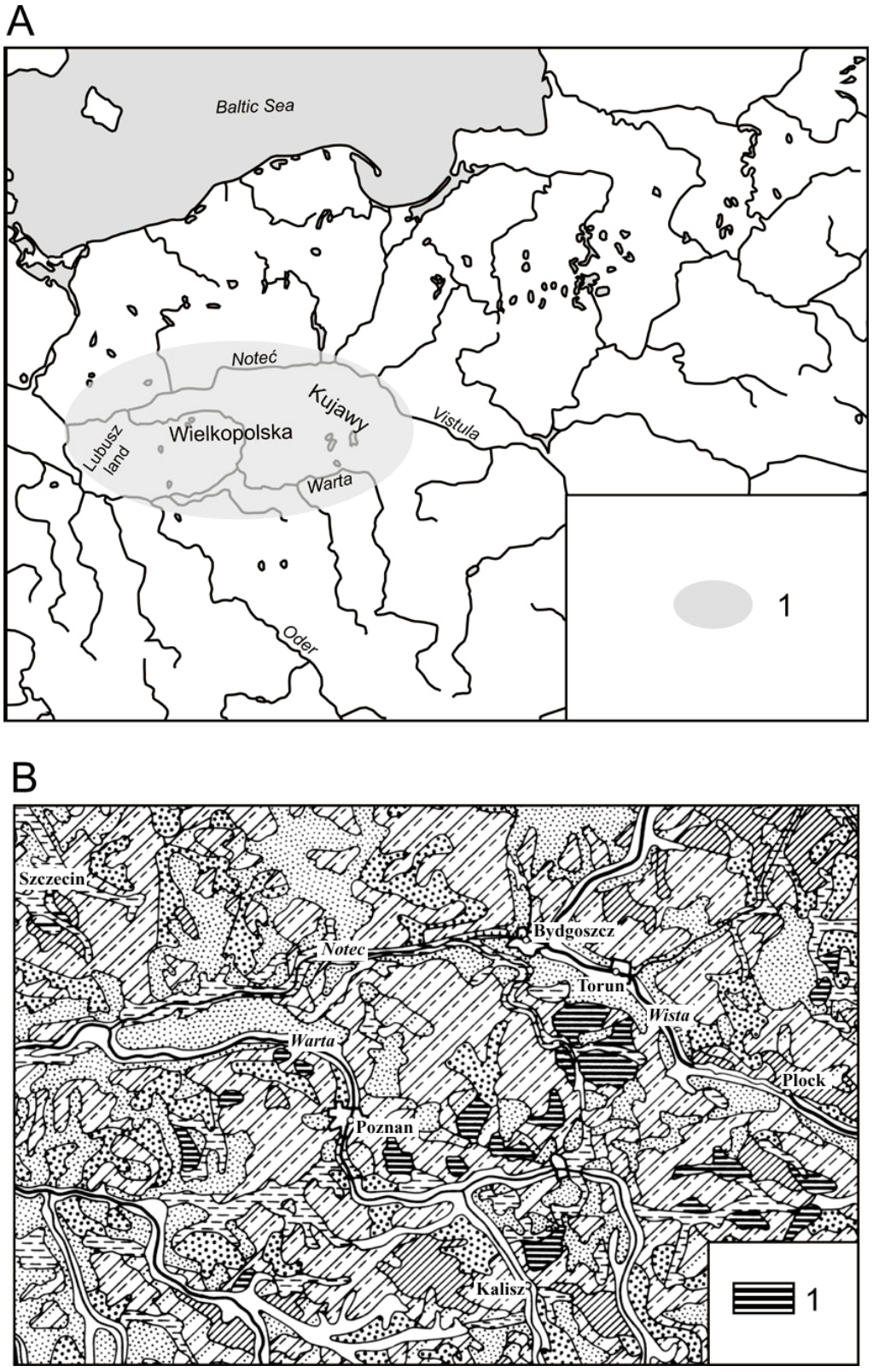

Fig. 1: A. Location of western part of the Polish Lowland (1) and regions mentioned in the text. B. Variety of natural landscapes on Lowland on the background of soil cover. (1 − black soils)

This had a favourable effect on the activities of societies inhabiting the 'fertile islands', making them cradles of Lowland cultural centres.

The most important and active centre was located in the Kujawy region, which was made up of several parts that differed in terms of environmental conditions: the Kujawy Plain in the centre, lakelands in the west and south, as well as large valleys in the north and east (Szmyt 1996). The very flat Kujawy Plain is covered with black soils, whereas both lakelands and valleys have a varied relief and are mainly covered with sandy or clay soils.

The Danubian newcomers in the Early Neolithic exclusively settled in the Kujawy Plain, which was covered with the most fertile soils. Remarkably, hunter−gatherers seem to have perceived the same part of Kujawy as unfavourable to human activity. Only a few hunter−gatherer sites, dated to the Mesolithic as well as the post−Mesolithic and thus contemporaneous with the Danubians, have been found in this region. In contrast, the settlers of the Linear Pottery culture formed a large settlement structure on the Kujawy Plain (Czerniak 1994: 38–58; Grygiel 2004, Pyzel 2010). From the Early Neolithic up to the Bronze Age and even later, the Plain was the most intensively exploited area by prehistoric communities.

The almost exclusive connection between agrarian settlement and fertile soils, which was so strongly marked in the Early Neolithic, gradually disintegrates in the Middle Neolithic. With the rise of the FBC, economic strategies adjusted to less fertile clay and sandy soils were developed and as a result, settlement and economic dualism emerged and persisted in Kujawy (Czerniak 1994: 139–41). At this time, there were two contemporaneous societies in this region which differed in their perception of the environment and had different selection criteria for land use. The Late Danubian settlement was exclusively linked to black soil areas (Czerniak 1994: 105; Grygiel 2008), while small early (phase I) FBC sites were located on sandy areas and their inhabitants had the "tendency to use the environment to a maximum" (Rzepecki 2004: 224) by applying a slash−and−burn economy. Added to this, the types of settlement varied in both cases as the FBC communities, which were more flexible in selecting areas for settlement, created new patterns of economic life (Czerniak 1994: 105–07).

HISTORY OF RESEARCH AND PRESENT STATE OF KNOWLEDGE

Previous research on the economy of Late Neolithic communities in the Polish Lowland focused mainly on the food economy and in particular plant cultivation, animal husbandry and the mutual relations of these farming activities. Considerable research was devoted to the study of the economy of raw materials as well as forms of organisation related to the production of flint and stone tools.

In his research on the food economy of the Neolithic Lowland, Wiślański (1969) provided a multi−dimensional analysis of a finds database. He maintained that "the closer to the end of the Neolithic, the greater the presence of seasonal dune encampments [...] the more rarely are farming tools found [...] and the remains of plant harvests as such" (Wiślański 1969: 256). In his view, during this period, there was an increase in the importance of animal husbandry, as well as hunting, fishing and gathering food. However, Wiślański did not share the view that agricultural harvesting came to an end at the close of the Neolithic. He assumed that all Lowland communities were consumers of farming harvests but stressed the opinion that not all these groups were necessarily involved in plant cultivation. According to Wiślański, in the economy of the Late Neolithic, a two or

even multi−track exchange emerged, expressing itself in the formation of larger and smaller zones of importance of plant harvests (Wiślański 1969: 257–58). The role of cereals has later been confirmed by increasing numbers of new finds, including macro−botanic deposits (Klichowska 1970, 1975, 1980).

Another milestone was Kośko's study ten years after Wiślański, which looked at the transformations at the end of the Neolithic and at the start of the Bronze Age in Kujawy (Kośko 1979). He argued that the main characteristic of the Late Neolithic was the process of disintegration of the FBC cultural model, "especially in the economic field", resulting in "an adjustment of cultural 'regulations [...] to that of the merits and limitations" of the natural environment (Kośko 1979: 113). This process reached its peak during the decline of the Neolithic, when in the Lowland, a new cultural model was taking shape known as the model of eco−cultural coherence. Its principle characteristics were the lowering of "demands in relation to the environment in undertaking decisions to settle" (Kośko 1979: 126) and this was accompanied by the formation of a coherent economy based mainly on various forms of animal husbandry including a semi−nomadic lifestyle. As a consequence, a deeply changed economic activity with lowered standards of technology of all ecological niches emerged, which included strategies previously avoided because of their unproductive environment. As a result, the decline of the Neolithic coincided with the blurring of previously strongly marked regional boundaries and the settlement system became dominated by very small and short−lived settlements and camps.

The conclusions drawn by Kośko and Wiślański became a point of departure for research programmes conducted in subsequent years. The most important results were gained in a programme of research conducted on the Kujawy Plain over a number of years (Cofta−Broniewska and Kośko 1982, 2002) and sub−programmes under its aegis concerned with the analysis of specific local cultural aspects, such as the project devoted to the Opatowice − Prokopiak's Mount (Kośko and Szmyt 2006, 2007a, 2007b). These projects brought an enormous, systematic and multi−aspectual addition to the finds database in terms of studies on the transformations of various aspects of Neolithic communities and their economy. This data was subsequently taken into account in studies on the economy of Late Neolithic societies such as the FBC Mątwy and Radziejów groups (Kośko 1981, 1988, Przybył 2009) or the GAC (Szmyt 1996), Decline Neolithic (Czebreszuk 1996), as well as in studies related to changes in the exploitation of domestic animals (Kośko and Szmyt 2004), processing of stone raw material (Chachli−Kowski 1997) and flint raw materials (Domańska and Kabaciński 2000, Kabaciński 2008). Balcer (1983) has carried out considerable work in the latter context and in terms of research on flint, recent functional analyses of select series of flint tools can also be mentioned (Winiarska−Kabacińska 2010).

In terms of the Late Neolithic, the local raw materials have only partly been identified and include clay and silt (Daszkiewicz and Prinke 1999) and erratic deposits (Chachli−Kowski 1994). The number of finds could be expanded by publications in the field of palaeobotany (e.g. Kośko 1988, Stępnik 2006, Koszałka 2007, Stępnik 2007a, 2007b) and archaeozoology (e.g. Sobociński and Makowiecki 1991, Makowiecki and Makowiecka 2000). To date, research on the processing of plants has brought inspiring results relating to fibres out of which 'cords' were made which in turn were impressed on the surface of clay vessels (Kośko and Szmyt 2010) as well as the use of tree bark in the production of wood tar (Pietrzak 2010). During the past 15 years, new data has been divulged by the results of 'linear' projects, including rescue research on gas pipeline

routes and highways (Kośko 2000, Bednarczyk and Kośko 2004).

In other regions of the Lowland, the range of research undertaken in relation to the economy of Late Neolithic communities was significantly more modest. For some time, research was conducted in Chwalim (Lubusz lakelands, Middle Oder region), where, among others, a site of Subneolithic hunter−gatherers and fishermen from the beginnings of the 3rd millenium BC has been documented (Kobusiewicz and Kabaciński 1993). In the Wielkopolska and the Lubusz regions, long−term excavation and research on FBC settlements from the late (Luboń) stage of development has been partly published, including sites such as Mrowino 3 (Tetzlaff 1981, 1989), Śrem 8 (Teztzlaff 1988, 1991), Chaławy 15 (Prinke 1991), Gorzów Wielkopolski 10 (Szczurek 1981). Furthermore, a monograph was completed and published on a small FBC settlement from phase IIIC in Komorniki 42 (Kabaciński and Sobkowiak−Tabaka 2004). Finds recorded from rescue work on the trans−European gas pipeline route, highways and motorways are yet to be published (exceptions being Bednarczyk et al. 2010, Prinke 2010, Szmyt 2010). Finally, there was an exceptionally valuable multi−disciplinary programme of research studies on the Noteć River crossing, immediately north of Kujawy, in Żuławka Mała (Rola 2009).

Palynological evidence for the Late Neolithic Lowland is rather limited, not only in relation to the small amount of published literature, but also in terms of the lack of precision in older diagrams. In this context, the most valuable sources are pollen records from Kujawy, including Osłonki (Nalepka 2005) and Nasiłowo (Makohonienko 2008), the Kościan Upland, including Lake Wonieść (Dörfler 2012) and the Lubusz region, including Chwalim (Wasylikowa 1993). Of great importance are the high resolution environmental reconstructions developed on the basis of laminate deposits on Lake Gościąż on the south−east approaches of Kujawy, namely the Gostynin lakeland (Ralska−Jasiewiczowa et al. 1998, Pelisiak et al. 2006). It should be noted that most forms of pollen evidence lend themselves to a general reconstruction of the natural environment and an assessment of human activity in the Late Neolithic. On account of the range of varied cultural practices in the immediate environment of the palynological site, only in exceptional cases is it possible to associate palynological indicators of human activity with a particular cultural group. One of the such exceptions is the Chwalim profile, which has documented solely the economic activity of hunter−gatherer Subneolithic populations.

In summary, the results of the studies discussed above allow for a new approach to the Late Neolithic economy in the west of the Polish Lowland, based on a significantly increased number of finds in relation to three−four decades ago. Nonetheless, the present state of research is far from satisfactory and is hindered by the great diversity of subject fields which are related to the diversity of natural and cultural landscapes in the Lowland. Direct evidence for economic activities is quite rich but unbalanced. Indeed, it is only possible to assess limited aspects of the economy, such as the supply of flint and stone raw material, for which the quantity of data allows detailed analysis. The majority of archaeological and bioarchaeological data relates to the FBC and the GAC. For the CWC, data is rather scarce, as there is a lack of evidence of dwelling construction and macro−botanic remains and animal bones are very rare. Similarly, data for Subneolithic communities is also limited.

To conclude, the present state of knowledge is still too poor in order to carry out detailed analyses, including the quantification of different output in a given context (Marciniak 2005: 102–19). Nonetheless, the current state of research on economic practices in the

Polish Lowland is a promising base for further exploration and represents a substantial collective effort on the part of numerous archaeologists.

SETTLEMENT ORGANISATION

An important characteristic of the Late Neolithic Lowland was the system of settlements based on a network of small (one−dwelling) and middle−sized (several−dwellings) settlements and camps or sites without traces of dwelling constructions. The existence of larger settlements (multi−dwellings) is uncertain. Those that at first were thus described (Wiślański 1969), are in fact made up of several smaller settlements or camps (Czebreszuk and Szmyt 2008). As suggested by research from e.g. Prokopiak's Mount in Opatowice (Kośko and Szmyt 2006, 2007a, 2007b) the sites in question represent a kind of "palimpsest" consisting of relics from chronologically differentiated settle−ments and camps.

In general, domestic sites were rather small (100−500 m^2 per house/hut) and consisted of small houses or huts (20−60 m^2, only in some cases 80−90 m^2). The number of houses/huts generally amounted to 5. There is a strong differentiation in the number of artefacts on the domestic sites and in the number of traces of construction (buildings, pits, postholes etc.). In all cases, these numbers are much higher for the TRB and the GAC sites than for CWC and Subneolithic sites (Czebreszuk and Szmyt 2008).

Late Neolithic burial sites are in the main represented by the GAC (Szmyt 1996) and CWC (Pospieszny 2009), though they are much less frequent than domestic sites (Czebreszuk and Szmyt 2011). Even less data is held at present on FBC graves, and no data is held from the Subneolithic groups (Józwiak 2003).

To conclude, our evidence suggests that basic societal units were small or medium−sized and that a given community did not exceed 30 people. A comparison of settlement traces leads to the conclusion that FBC groups were generally the largest communities and that CWC groups were the smallest in number (Czebreszuk and Szmyt 2008). It is therefore accepted that with time, the increasing role of small settlements and camps corresponded to the growing mobility of communities. In this context, the highest degree of mobility can be attributed to the communities of the CWC (Machnik 2009, Czebreszuk and Szmyt 2011).

FOOD SUPPLY

The food economy on the Lowland was characterised by a range of possibilities. During the Late Neolithic, agrarian strategies became decidedly dominant in this region. Instead of farming such strategies as hunting, fishing and gathering are less developed. Their domination or even exclusiveness is typical for Subneolithic populations. The most clear evidence of this are the cultural remnants identified in Chwalim on the Lubusz lakelands. The remains discovered at this site show that inhabitants of this settlement made use of Mesolithic techniques for the production of flint tools and handled clay vessels which differed from the standard Neolithic types (Kobusiewicz and Kabaciński 1993: 54–60; Szmyt 1993: 61–72). The pollen sequence in the profile from the site (Wasylikowa 1993: 97–98) shows that this peripheral region of the Lowland had not been reached by early agricultural communities but that it was exploited for long periods of time by epi−Mesolithic hunters, fishermen and gatherers. Indeed, only wild animals and fish remains were identified on the site (Gautier 1993: Table 56).

Late Neolithic agrarian strategies were dominant in the Lowland and various

configurations of basic farming sectors emerged including plant cultivation (especially crop cultivation) and animal rearing (Kośko and Szmyt 2004). It can be argued that both plant cultivation and animal breeding have been developed from the same origins, as early agrarian populations (Danubians) heavily influenced the first local farmers, namely the early FBC populations.

In Kujawy, an assessment of anthropogenic changes of the natural environment is possible. For example, pollen evidence in sections corresponding to the first half of the Late Neolithic indicates a period of intensive human activity, including deforestation, land use for pastures and cultivation. E.g. in Nasiłowo, the period 3400−2900 BC is marked by a "maximum of anthropogenic indicators, in particular *Plantago lanceolata* and *Artemisia*, and a high participation of pollen seeds such as wheat [...] During this period, the pollen spectra record the highest profile of grass elements (NAP) recording 38,8−40,5% on the basis of (AP+NAP)" (Makohonienko 2008: 365). There is also a second decline of elm tree (*Ulmus*), dated to circa 3150 BC, which was probably caused by an intensification of anthropopressure. The Nasiłowo profile shows a stabilisation of the role of synantropic plants at a somewhat lower level after 2900 BC (Makohonienko 2008). The results correlate with archaeological research on the neighbouring settlement complex in Opatowice−Prokopiak's Mount (Kośko and Szmyt 2006, 2007a, 2007b).

Pollen evidence from Gościąż (Ralska−Jasiewiczowa et al. 1998) on the south−east approaches to Kujawy (Gostynin lakeland) is similar to the Nasiłowo record. For the period under discussion, there are two phases of natural environment transformation, separated by a stage of weakened anthropopressure. Phase 6 is dated to 3600−3200/3100 BC and shows the highest incidence of pastoral and ruderal plants in the Neolithic as well as intensive traces of burning (Pelisiak et al. 2006: 22 and Fig. 4). Added to this, in this phase, there were sporadic instances of grains (Cerealia−type, Triticum−type and Hordeum−type) and a decline of *Ulmus* pollen can also be observed. In contrast, phase 7 (3180−2755 BC) documents a decrease in human activity, though deforestation continues to be marked, while wheat and barley pollen are somewhat more numerous (Pelisiak et al. 2006: 22 and Fig. 4).

In both Nasiłowo and Gościąż, the settlements nearest to the pollen profile are represented by various cultural groups, primarily the FBC and the GAC. As a consequence, the human activity documented in pollen spectra cannot be attributed to only one culture. In fact, the palynological documentation shows the sum of various forms of activity led by Late Neolithic communities with differing economic structures.

Most of the macro−botanic evidence concerns the FBC and there are numerous indications of plants harvested in this culture. For example, in the cereal deposits from Kujawy, including Radziejów 1, Zarębowo 1 and Opatowice 12 (Klichowska 1970, 1975, 1980), wheat (*Triticum dicoccum*) was dominant. However, at the Inowrocław−Mątwy site 1, barley (*Hordeum vulgare*) predominated in impressions on daub (Kośko 1988: Table 9). In Opatowice 42, among impressions on pottery and daub, imprints of cultivated plants and especially *Triticum* (Koszałka 2007: Table 13.2) prevailed. Added to this, plant processing tools such as pestles and querns are regularly encountered at FBC sites and functional analyses have identified flint tools used for crop harvests (Winiarska−Kabacińska 2010: 196–97). In general, it can be argued that the Late Neolithic communities of the FBC not only made use of cultivated plants but also harvested these.

Compared to the FBC, macro−botanic remains are significantly less numerous in the GAC (Szmyt 1996: 166–67; Koszałka 2007: 368). To date, only 40 such remains have been recorded and these mostly consist of imprints on pottery, including grain seeds, mainly wheat and to a lesser extent barley, but also pea *Pisum sativum* and broad bean *Vicia fabia*. The number of querns, pestles and harvest tools from GAC sites is also less numerous than in the FBC. Thus, as a result of the recording bias, the consumption of cultivated plants by other communities (the CWC and the Subneolithic groups) remains unclear.

Husbandry and the exploitation of domestic animals have been documented more fully than plant cultivation. However, this applies only to the GAC and the FBC (Kośko and Szmyt 2004), as in the case of the CWC, animal bone remains have only rarely been evidenced (e.g. pig bones in Bożejewice site 28; Czebreszuk 2000: 232). Data shows that in the FBC and the GAC, there was a dominant use of domesticated animals (cattle, sheep or goats, pigs and possibly horses), whereas the use of local wild animal resources was very limited. From the Early Neolithic until the end of the Bronze Age and even later, local wild animals formed a small part of consumed animals. Only Subneolithic hunter−gatherers subsisted exclusively on wild animals (cf. Chwalim). Wild animal bone remains found at other settlements dated to 3500 BC to 2500 cal BC represent only less than 5 or 10% of the entire assemblages. Even at sites at river valleys such as Żuławka Mała 1, there are few post−consumption remains of wild fauna (Makowiecki 2009). However, it is important to point out that the collection of animal remains was mainly done by hand and this might explain the low representation of fish remains in the above percentage (Makowiecki 2003: 83–84).

RAW MATERIAL SUPPLY: FLINT

The Late Neolithic is a stage in which a broad exploitation of local sources of mineral and organic raw materials and a sporadic exploitation of materials from distant parts is documented. Local flint raw material (Baltic cretaceous flint) was of rather poor quality for making refined tools and therefore, Early and Middle Neolithic communities extracted the majority of flint from the south (good quality flint types: ‘chocolate’, Świeciechów, Jura, Volhynia, later also striped flint from Krzemionki). However, from the Late Neolithic onwards, local raw material was already accepted for most routine purposes. Its frequency at sites exceeds often 95% of all artefacts, and at times even 100%.

Baltic flint could have been extracted in regions of natural trenches in moraine materials, often occurring on the Lowland. This local flint was mainly processed according to the scaled technique (Domańska and Kabaciński 2000: 389). With the aid of a coring technique, flakes and less frequently, blades, were produced (Domańska 2007b: 311–13). Most often, products of a small dimension were made (up to 40 cm in height). The procuring and processing of Baltic flint (from small raw slabs to finished products) took place within the settlement itself or at dwellings (Domańska 2007b: 312–13). Collections of flint waste have been identified as remains of small domestic flint workshops (e.g. Mirkowice 33: Kabaciński and Sobkowiak−Tabaka 2005: 54–55). Structural analysis of such collections from settlements and camps have shown that these tools were mainly ‘home made”, non−specialised and unrefined. ‘Classical’ tools were often made out of ‘southern’ materials with the aid of a coring technique. Flint of the so−called Volhynian−type, Świeciechów−type, Jura−type or Krzemionki−type made its way to the Lowland, most often in the form of axes or finished products made out of macrolithic

blades (Domańska 2007a: 198). Only chocolate flint was processed partially *in situ* and at some sites, there is evidence of flakes and blades from this material (Domańska 2007b). It is important to emphasise that axes from so−called southern raw materials (in particular chocolate and striped flint) were recycled and re−worked into cores after being used or damaged and from these, small flakes and veneers were made (Balcer 1983: 222; Kabaciński and Sobkowiak−Tabaka 2005: 57).

Thus, Late Neolithic flint production on the Lowland had a dual function (Balcer 1983: 154, 222–23), dependent on the material exploited. Local Baltic flint was processed by the simplest means into small goods that were used as 'functional tools'. In contrast, non−local materials from the south of Poland had much better physical properties and were most often made by using the classical coring technique. This produced half−finished products of good quality such as flakes and blades which were made use of at work after retouching. Only a small portion of the half−finished product was re−made into tools such as scrapers, slicers and scrubbers.

RAW MATERIAL SUPPLY: GROUNDSTONE

The literature underscores the fact that in the Late Neolithic on the Lowland there was a decided intensification of stone processing (Chachli−Kowski 1997: 283). During this period, finished products, half−products, aggregates and waste were considerable in number in relation to source categories. At the majority of sites, local erratic materials were used, such as stone slabs lying on the surface or in secondary deposits and these have been identified in moraine materials and in river valleys. There is also evidence of exploitation of secondary erratic deposits from moraine pavements in Kujawy, where a complex of extraction pits was excavated and documented on site Goszczewo 13 (Chachli−Kowski 1994). Comparing the structures of erratic materials (Prinke 1983: Fig. 2; Chachli−Kowski 1997: Table 34) and stone assemblages from Late Neolithic settlement contexts, it is estimated that the former could have met up to 95−100% of the inhabitants' needs in the Lowland.

Raw material from local sources (post−glacial erratic blocks) was used mostly in the production of multi−purpose tools such as querns, grinders, polishing plates, polishers etc. (Chachli−Kowski 1997). Only a small number of the refined tools or weapons (such as axes) were made from the very good quality rocks of southern origin, for example basalt from Silesia and Volhynia, diabase from north Bohemia or serpentinite from Silesia (Prinke 1983: 128–31; Chachli−Kowski 1998: 172–76).

RAW MATERIAL SUPPLY: CLAY AND SILT

Late Neolithic societies made wide use of local deposits of Quaternary clay and silt. The former in particular were easily accessible, as they lay in shallow deposits under the surface in many places on the Lowland (Wirska−Parachoniak 1983: 137–38). They were used for building (as daub) and for pottery. From the Late Neolithic onwards, traces of exploitation of silt deposits can be found in the Lowland. The chemical and mineralogical composition of some FBC and Mątwy−type ceramic samples was found to be similar to Pliocene loam deposits in the Toruń Basin (Daszkiewicz and Prinke 1999: 327–30). This type of material only appears in a few places in near−surface deposits. In contrast, GAC pottery and daub from FBC settlements have been made of Quaternary clays, which are decidedly more accessible (Daszkiewicz and Prinke 1999: 331).

RAW MATERIAL SUPPLY: AMBER

The Late Neolithic is a period of increased interest in Baltic amber (succinite) as material used in rituals and ceremonies. Artefacts made of amber were most often deposited in funerary contexts during the ceremony itself or in post−funerary rituals (Mazurowski 1983, Czebreszuk 2011: 36–45). In contrast to the Jutland region, where the zenith of amber exploitation falls around the 4th millennium BC and ends between the 4th and 3rd millennium BC, the Polish Lowland saw an increase of amber products around 3200 BC and this trend continued into the Early Bronze Age up to c. 1700 BC, albeit with certain fluctuations (Czebreszuk 2011: 30–47).

Due to the geology and the chemical properties of succinite, a precise identification of its geographic origins is not possible (Czebreszuk 2011: 22–24). In this context, is relevant to mention various Tertiary deposits among which the most accessible are the succinite layers at the Gulf of Gdańsk, the so−called Sambian centre, as well as Quaternary deposits identified across broad stretches of central, eastern and western Europe (as well as the Polish Lowland) and including the Jutland (Czebreszuk 2011: 30–31). However, it should be added that the quantity and quality of this material was markedly larger and better in Tertiary deposits than in Quaternary deposits (Czebreszuk 2011: 24). As a consequence, despite the identification of surface outcrops of amber in various parts of the Lowland such as the Noteć valley, it is accepted that it was primarily the Tertiary deposits from the layers at Gulf of Gdańsk which were exploited. At this location, Late Neolithic encampments of amber gatherers and workshops where this material was processed into half−products or even finished products were identified (Mazurowski 1999).

RAW MATERIAL SUPPLY: WOOD

The use of wood in building construction and as a fuel has been demonstrated by several analyses of building remains (Szmyt 2002) as well as by charcoals found mostly in settlements features (e.g. Stępnik 2006, 2007a, 2007b). Important new discoveries include the identification of a wooden construction of a crossing in the Noteć valley, north of Kujawy (Żuławka Mała 1 site: Rola 2009: 76–86). At this crossing, oak was the main raw material but other materials used in this construction included alder, ash, maple, poplar, beech, birch, willow and even lime (Stępnik 2009: Table VI). For the vertical stakes which were hammered into the ground as well as for the horizontal logs that stabilised the construction, mainly ash and oak were used. However, for the fascines, branches, waste and bark from deciduous trees available in the surrounding areas of riparian and ash−marsh forests were used (Stępnik 2009: 123).

Wood tar was also produced, as indicated by evidence of its remains in the FBC (Langer et al. 2007) as well as in the GAC and CWC (Pietrzak 2010: 103–04). Wood and bark from birch and pine were processed for the production of tar and this in turn was used for a variety of purposes such as glue, lubrication and conservation, as an element of colorants as well as for its supposed medicinal and magical properties (Pietrzak 2010: 54–60).

RAW MATERIAL SUPPLY: FIBRES

From numerous sites, there are artefacts that were used in the processing of fibres. Most often, these are clay spindle whorls, but there are also bone needles. There are numerous finds from FBC settlements (Kośko and Szmyt 2007b), but far less evidence from GAC settlements (Szmyt 1996: 199). One unique example is a rope fragment made of

plant fibres found at a GAC site in Kaczkowo (Wiślański 1966: 240). The use of plant fibres is confirmed by microscopic analysis of the so−called cord imprints on the pottery of the FBC (Kośko et al. 2010: 150).

RAW MATERIAL SUPPLY: COPPER AND BRONZE

In the Late Neolithic context on the Polish Lowland there are relatively few metal objects. Some of these objects have been lost or have little documentation. The majority of these artefacts have been discovered in GAC graves such as Humlin 1, Janiszewek 1 and Stary Brześć Kolonia (Wiślański 1966) and Bożejewice 8, a Late Neolithic burial with steppe traits (Kośko and Kločko 1991), but metal objects have also been recovered from Pikutkowo 3 and Dopiewo 26, both of which are CWC graves (Pospieszny 2009: 75). Only a few objects come from domestic sites such as the GAC site of Przybranowo 10 (Szmyt 1996: 58).

From current evidence, it can be argued that metal artefacts reached the Lowland through the communities' participation in long−distance exchange networks and through migration along these routes, as is possibly the case of Bożejewice 8. Added to this, the identification of a crucible fragment in Przybranowo 10 suggests the possibility of local smelting of metal (Szmyt 1996: 58).

PRODUCTION OF ARTEFACTS

The majority of artefact production shows a continuation of technological practices of earlier Neolithic phases. However, in the Late Neolithic, changes based on the adaption to local raw materials were introduced and no doubt in relation to this, changes can also be seen based on preferences of specific forms of technology, especially in terms of the production of flint materials. For example, there is evidence of a link between applied techniques and the use of particular types of raw material, as is the case with Baltic cretaceous flint and scaled technique.

In addition to this, there is evidence of very fine and small artefacts, which is another sign of the adaption to the limitations of the available materials (Budziszewski et al. 2008: 47). At the same time, there was an increase in ordinary *versus* specialised techniques used in the production of tools and weapons. The specialised techniques were used in the production of special objects such as axes made out of sand flint in the GAC, which must have involved a multi−stage process (Migal 1997). In contrast to flint artefacts, remains from settlements and graves often had an *ad hoc* nature, which has been described as "technological primitivism" (Budziszewski et al. 2008: 47). These artefacts were produced using simple techniques that were nonetheless "fully effective and assured an efficient exploitation of the most easily available, smaller slabs of flint" (Budziszewski et al. 2008: 47).

In this context, it can be argued that there were two types of production: a specialised production carried out by those with special training and a 'non−specialised' production which could be carried out by anyone for personal needs. Observations from other regions suggest that there was indeed a specialist production, carried out by those with access to knowledge of advanced flint and mining technologies (Migal 1997, Budziszewski 2000, Migal 2006). The limiting or minimalisation of 'daily' needs also occurred in construction, as can be seen from the comparison of the more or less monumental tombs of various sizes with the remains of very modest dwellings (Czebreszuk and Szmyt 2008: 227–35; Szmyt 2011).

The clear majority of identified production activities took place within domestic sites and dominantly in small and medium sized

settlements and camps. Relatively separate production loci (workshops) are rarely discovered. To date, flint and stone workshops have been discovered at only a few sites (Chachli−Kowski 1997: 281; Domańska and Kabaciński 2000: 385–87). These workshops have been recorded as concentrations of half−products, production waste and possibly slabs of materials. The workshops were designed to meet the daily needs of those in the settlement. In the case of stone workshops, production traces of grinding tools (querns and pestles), axes, multifunctional tools (polishing plates), as well as hammer axes and hammers are usually found (Chachli−Kowski 1997: Table 4). In flint workshops, traces of flakes and blades production have been identified (Domańska and Kabaciński 2000: 385–87). The majority of these workshops are associated with the FBC and considerably less of these have been found in GAC contexts. Added to this, some artefacts made from exogenous raw material and demanding specialist skills reached the Lowland as finished products. Access to these goods was made possible by means of a long−distance network of contacts linking the Late Neolithic communities from various regions (Balcer and Kowalski 1978, Szmyt 1996: 217–38).

DISTRIBUTION AND CONSUMPTION

Models of distribution and consumption were strictly related to forms of social organisation and settlement systems that were different in specific cultural traditions, such as the FBC, GAC, CWC and Subneolithic (Szmyt 2002: 196–210; Czebreszuk and Szmyt 2011: 273–84). Because of the generally dispersed settlement organisation and the domination of relatively small domestic sites (Czebreszuk and Szmyt 2008: 224–39), it can be argued that the basic agents of distribution and consumption were small groups of people that integrated into larger communities only on a cyclical basis (Czebreszuk and Szmyt 2011).

These small groups could have been based on a possible kinship system, although to date, this has not been confirmed by DNA analysis. A kinship system as a form of social organisation has been put forward for the regional GAC group in Kujawy (Szmyt 1996: 201–16, 2002: 216–19). In determining the relations between the communities of the GAC and CWC in Kujawy, the important role that communal and mainly ritual activities played has been pointed out, as these were different in each case (Czebreszuk and Szmyt 2011: 277–85). Such communal activities increased ritual and cultural capital and reinforced the differences between both cultural traditions and the groups that carried them out.

A general assessment shows that the majority of goods (including food) were distributed in dispersed basic groups. To date, the results of spatial analyses (Czebreszuk and Szmyt 2011: 271–74) do not point towards the existence of Late Neolithic ‘prerogative−bearing’ groups in which access to rare goods was a privilege. However, there is a clear indication of a change over time in ‘southern’ supplies of exclusive types of flint and stone (Chachli−Kowski 1997: 195–96). For example, the FBC saw a peak in the use of Volhynian and Świeciechów flint (Kabaciński 2008: 184–86), in the GAC, there was a special interest in the Krzemionki−type, ie. striped flint and for the CWC, there is evidence for exclusive use of serpentinite from Silesia (Pospieszny 2009: 72).

A separate, as yet unexplained issue is the presence in local communities of individuals with access to specialist knowledge and skills that enabled the production of particular tools such as weapons such as stone hammer and battle axes or refined flint axes. At the same time, graves with unusually numerous or ‘special’ furnishings indicate the presence of rules according to which the privilege of taking part in the distribution and consumption of particular goods was within the domain of the chosen. Most of these cases

are known from CWC circle. There is evidence of both adult males and adult women being involved in these practices (Pospieszny 2009). It is more difficult to identify the situation in the GAC, as during this period, collective graves were the dominant form of burial (Czebreszuk and Szmyt 2011: 274). However, it may be argued that similar privileges functioned in this context, as the grave from Stary Brześć Kolonia shows (Wiślański 1966: 230).

In terms of consumption in the Late Neolithic, three forms can be identified: 'everyday', 'communal' and 'symbolic'. Everyday consumption had a function in dispersed basic groups, but the autonomy of these groups was limited by the rules of a given community. The 'communal' form was based on the consumption of a variety of goods by groups in a larger community, possibly based on kinship, as can be identified by the remains of post−funeral rituals. In some cases (mainly concerning food), it can be argued that this type of consumption took a (cyclical?) form, including the practice of feasting near ancestors' graves, as can be seen from traces of camp fires and broken or burnt animal bones. Most of these examples have been documented in the FBC and the GAC (Szmyt 2011). It should be noted that in the Danubian 'tradition' this type of consumption took place mostly in settlements, and that its association with post−funeral rituals occurred in the FBC (Marciniak 2005: 205–26).

Finally, 'symbolic' consumption can be traced from the circulation of some goods (both objects and food) that represented the above mentioned restricted forms of consumption. Some important goods which were often made from 'exotic' materials such as 'distant' stone and flint types, amber and copper, were removed from circulation. This type of consumption took place in the context of funerary rites, when objects were placed in graves or in their immediate surroundings during funerary and post−funerary ceremonies.

The cultural traditions related to symbolic consumption existed in different forms, which defined the various collections of relevant objects. The greatest differences over time can be seen among products that fulfilled a number of functions, such as weapons and status markers. In the FBC, this applied to stone hammer axes, in the GAC, flint axes, and in the CWC, stone battle axes and quiver kits. There is also evidence of symbolic consumption in terms of aquatic offerings and cereal deposits which were known from FBC and which gradually disappeared in the second half of the 4th millenium BC (Kośko 1981: 158; Cofta−Broniewska and Kośko 1982: 69). Another type of symbolic consumption are the so−called animal graves (Szmyt 2006). The placing of whole or selected parts of animals (mainly cattle) in specially prepared pits implies the exclusion of some food resources from 'everyday' consumption. There is particularly comprehensive evidence of animal deposits in GAC communities (Szmyt 2008: 222–27; Czebreszuk and Szmyt 2011: 277–78). For example, in the Krasnaselskoje cemetery complex located in Belorussia (Charniauski 1994: 87–89), far east from the Polish Lowland, a special place has been found with remains of 13 animals, including 7 entire cows next to human graves, signifying that at least 714 to 3500 kg of meat (according to various cattle measures) was excluded from everyday consumption (Szmyt 2004: Table 2).

Broadly speaking, symbolic consumption in the context of Late Neolithic funerary rituals would appear to be a relatively stable phenomenon. Other forms of symbolic consumption, however, were subject to transformation, which led to a gradual disappearance of aquatic and cereal offerings (exclusively known from the FBC) and the appearance (mostly in the GAC) of animal deposits (Szmyt 2008: 222–27). Moreover, later changes in symbolic consumption included metalwork deposits, the so−called

ritual hoards (Bradley 1988: 249–52), which were characteristic for the Bronze Age.

CONCLUSION

Whether the Late Neolithic can be defined as one economy or a number of economies is neither a simple nor unambiguous question. On the one hand, it would appear that Late Neolithic economy can be understood in terms of its departure from settlement and economic patterns of the Early and Middle Neolithic. The common characteristic of Late Neolithic societies in the Polish Lowland was the use of local raw material reserves in order to meet the main daily needs of its inhabitants. In some fields (e.g. in flint processing), this led to the simplification of techniques and resulted in the optimalisation of production processes which are presently understood according to the principle of a maximum effect with a minimum output. However, during this period, long−distance network associations also developed which were stimulated by community and ideological needs. As a consequence, raw materials or special artefacts from afar reached the Lowland, bringing with them the idea of insignia or prestige objects.

On the other hand, the departure from previous economic patterns took place in various ways and to various degrees. It can be argued that the strategies used by FBC communities diverged the least from previous economic forms, while CWC communities differed the most from past economic systems. Somewhere in the middle between FBC and CWC were GAC groups, while Subneolithic communities were on the margin of any economic system, as these groups were mostly making use of non−agrarian methods in order to exploit the environment.

As a result, Late Neolithic communities in the Polish Lowland followed diverse economic strategies in regard to food supply. In this way, they bypassed most of the environmental limitations of earlier periods. From this, it can be put forward that several Late Neolithic economies existed and that the realisation of a specific economic strategy was conditioned by cultural factors inherited from previous traditions. There have been significant differences in the economy between communities representing different traditions. This also applies to goods subject to symbolic consumption, the form which underwent the most important changes in the period under discussion.

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BIBLIOGRAPHY

Balcer B, Kowalski K. 1978. Z badań nad krzemieniem pasiastym w pradziejach. Wiadomości Archeologiczne 62(2): 127−145

Balcer B. 1983. Wytwórczość narzędzi krzemiennych w neolicie ziem Polski. Warsaw: Ossolineum

Bednarczyk J, Kośko A. 2004 (eds.). Od długiego domu najstarszych rolników do dworu staropolskiego. Wyniki badań archeologicznych na trasach gazociągów Mogilno – Włocławek i Mogilno – Wydartowo. Poznań: Wydawnictwo Poznańskie

Bednarczyk J, Kabaciński J, Kośko A. 2010 (eds.). Osadnictwo Kotliny Kolskiej. Archeologiczne badania ratownicze na trasie autostrady A2. Via Archaeologica Posnaniensis. Źródła archeologiczne z badań wykopa−liskowych na trasach dróg i autostrad 1. Poznań: Wydawnictwo Poznańskie

Bradley R. 1988. Hoarding, recycling and the consumption of prehistoric metalwork: technological change in western Europe. World Archaeology 20(2): 249−260

Budziszewski J. 2000. Flint working of the South−Eastern group of the Funnel Beaker culture: Exemplary reception of Chalcolithic socio−economic patterns of the Pontic Zone. In Kośko A (ed.). The Western border area of the Tripolye Culture. Baltic−Pontic Studies 9: 256−281

Budziszewski J, Chachli−Kowski P, Czebreszuk J, Winiarska−Kabacińska M. 2008. Grób społeczności kultury ceramiki sznurowej z Dąbrowy Biskupiej, stan. 21, pow. Inowrocław, woj. kujawsko−pomorskie. In Bednarczyk J, Czebreszuk J, Makarowicz P, Szmyt M (eds.). Na pograniczu światów. Studia z pradziejów międzymorza bałtycko−pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko w 60. rocznicę urodzin. Poznań: Wydawnictwo Poznańskie. Pp. 31−69

Chachli−Kowski P. 1994. Późnoneolityczne wybierzysko surowców skał niekrzemionkowych w miejscowości Goszczewo, gm. Aleksandrów Kujawski, woj. Włocławek, stanowisko 13. Folia Praehistorica Posnaniensia 6: 59−122

Chachli−Kowski P. 1997. Kamieniarstwo późnoneolitycznych społeczeństw Kujaw. Studia i materiały do dziejów Kujaw 8. Poznań: Uniwersytet im. Adama Mickiewicza w Poznaniu

Charniauski M. 1994. Materials of the Globular Amphora Culture in Belarus. In Kośko A (ed.). Eastern exodus of the Globular Amphora Culture people: 2950−2350 BC. Baltic−Pontic Studies 4. Pp. 87−97

Cofta−Broniewska A, Kośko A. 1982. Historia pierwotna społeczeństw Kujaw. Poznań: Państwowe Wydawnictwo Naukowe

Cofta−Broniewska A, Kośko A. 2002. Kujawy w pradziejach i starożytności. Poznań: Fundacja Ochrony Dziedzictwa Kulturowego Społeczeństw Kujaw

Czebreszuk J. 1996. Społeczności Kujaw w początkach epoki brązu. Materiały do syntezy pradziejów Kujaw 7. Poznań: Uniwersytet im. Adama Mickiewicza w Poznaniu

Czebreszuk J. 2000. Osadnictwo społeczności kultury ceramiki sznurowej. In Kośko A (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie. Pp. 423−454

Czebreszuk J, Kośko A, Makarowicz P, Szmyt M. 2000. Podsumowanie. In Kośko A (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie. Pp. 569−571

Czebreszuk J. 2001. Schyłek neolitu i początki epoki brązu w strefie południowo−zachodniobałtyckiej (III i II tys. przed Chr.). Poznań: Wydawnictwo Poznańskie

Czebreszuk J, Szmyt M. 2008. Siedlungsformen des III. Jahrtausends v. Chr. in der polnischen Tiefebene (Kulturen der Trichterbecher, Kugelamphoren und Schnurkeramik). Stand und

Perspektiven der Untersuchungen. In Müller J, Dörfler W (eds.). Umwelt – Wirtschaft – Siedlungen im dritten vorchristlichen Jahrtausend Mitteleuropas und Südskandinaviens. Offa−Bücher 84. Neumünster: Wachholtz. Pp. 219−242

Czebreszuk J. 2011. Bursztyn w kulturze mykeńskiej. Poznań: Wydawnictwo Poznańskie

Czebreszuk J, Szmyt M. 2011. Identities, differentiation and interactions on the Central European Plain in the 3rd millennium BC. In Hansen S, Müller J (eds.). Sozialarchäologische Perspektiven: Gesellschaftlicher Wandel 5000−1500 v. Chr. zwischen Atlantik und Kaukasus. Archäologie in Eurasien 24. Darmstadt: Philipp von Zabern. Pp. 269−291

Czerniak L. 1994. Wczesny i środkowy okres neolitu na Kujawach 5400−3650 p.n.e. Poznań: Polska Akademia Nauk Instytut Archeologii i Etnologii

Daszkiewicz M, Prinke D. 1999. Archaeokeramologische Untersuchungen zur Trichterbecherkultur in Kujawien (Zentralpolen). Ethnographisch−Archaeologische Zeitschrift 40(3): 299−336

Domańska L, Kabaciński J. 2000. Krzemieniarstwo społeczeństw późno−neolitycznych. In Kośko A (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie. Pp. 379−392

Domańska L. 2007a. Wytwórczość z krzemienia. In Kośko A, Szmyt M. Opatowice – Wzgórze Prokopiaka II. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej II. Poznań: Wydawnictwo Poznańskie. Pp. 181−199

Domańska L. 2007b. Wytwórczość z krzemienia. In Kośko A, Szmyt M. Opatowice – Wzgórze Prokopiaka III. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej III. Poznań: Wydawnictwo Poznańskie. Pp. 299−314

Dörfler W. 2012. Palaeoecological reconstruction of the Bronze Age landscape around lake Wonieść, Great Poland. In Hildebrandt−Radke I, Czebreszuk J, Dörfler W, Müller J (eds.). Anthropogenic Pressure in the Neolithic and Bronze Age in the Central−European Lowlands. Poznań: Bogucki Wydawnictwo. In press

Gautier A. 1993. The faunal remains. In Kobusiewicz M, Kabaciński J (eds.). Chwalim. Subboreal hunters−gatherers of the Polish Plain. Poznań: Institute of Archaeology and Ethnology Polish Academy of Sciences. Pp. 79−89

Grygiel R. 2004. Neolit i początki epoki brązu w rejonie Brześcia Kujawskiego i Osłonek I. Wczesny neolit. Kultura ceramiki wstęgowej rytej. Łódź: Fundacja Badań Archeologicznych imienia Profesora Konrada Jażdżewskiego, Muzeum Archeologiczne i Etnograficzne w Łodzi

Grygiel R. 2008. Neolit i początki epoki brązu w rejonie Brześcia Kujawskiego i Osłonek II. Środkowy neolit. Grupa brzesko−kujawska kultury lendzielskiej. Łódź: Fundacja Badań Archeologicznych imienia Profesora Konrada Jażdżewskiego, Muzeum Archeologiczne i Etnograficzne w Łodzi

Józwiak B. 2003. Społeczności subneolitu wschodnioeuropejskiego na Niżu Polskim w międzyrzeczu Odry i Wisły. Materiały do syntezy pradziejów Kujaw 11. Poznań: Uniwersytet im. Adama Mickiewicza w Poznaniu

Kabaciński J, Sobkowiak−Tabaka I. 2004. Komorniki. Chata ludności kultury pucharów lejkowatych. Poznań: Poznańskie Towarzystwo Prehistoryczne, Instytut Archeologii i Etnologii Polskiej Akademii Nauk Oddział w Poznaniu

Kabaciński J, Sobkowiak−Tabaka I. 2005. Osadnictwo kultury pucharów lejkowatych i kultury amfor kulistych w Mirkowicach, stanowisko 33, gm. Mieścisko, pow. Wągrowiec, woj. wielkopolskie. Fontes Archaeologici Posnanienses 41: 37−90

Kabaciński J. 2008. Inwentarze krzemienne ze stanowisk neolitycznych Kotliny Toruńsko−Bydgoskiej. In Bednarczyk J, Czebreszuk J, Makarowicz P, Szmyt M (eds.). Na pograniczu światów. Studia z pradziejów międzymorza bałtycko−pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko w 60. rocznicę urodzin. Poznań: Wydawnictwo Poznańskie. Pp. 167−190

Klichowska M. 1970. Neolityczne szczątki roślinne z Radziejowa Kujawskiego. Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi, Seria Archeologiczna 17: 165−174

Klichowska M. 1975. Najstarsze zboża z wykopalisk polskich. Archeologia Polski 20(1): 83−143

Klichowska M. 1980. Pszenica z neolitycznego stanowiska w Opatowicach, woj. włocławskie. Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi, Seria Archeologiczna 26: 57−65

Kobusiewicz M, Kabaciński J. 1993. Chwalim. Subboreal hunters−gatherers of the Polish Plain. Poznań: Institute of Archaeology and Ethnology Polish Academy of Sciences

Kośko A. 1979. Rozwój kulturowy społeczeństw Kujaw w okresach schyłkowego neolitu i wczesnej epoki brązu. Seria Archeologia nr 12. Poznań: Uniwersytet im. Adama Mickiewicza w Poznaniu

Kośko A. 1981. Udział południowo−wschodnioeuropejskich wzorców kulturowych w rozwoju niżowych społeczeństw kultury pucharów lejkowatych. Seria Archeologia nr 19. Poznań: Uniwersytet im. Adama Mickiewicza w Poznaniu

Kośko A. 1988. Osady kultury pucharów lejkowatych w Inowrocławiu−Mątwach woj. Bydgoszcz, stanowisko 1. Inowrocław: Uniwersytet im. Adama Mickiewicza w Poznaniu

Kośko A, Kločko V. 1991. Bożejewice, gm. Strzelno, woj. Bydgoszcz, stanowisko 8. Kurhan z późnego okresu epoki neolitu. Folia Praehistorica Posnaniensia IV: 119−143

Kośko A. 2000 (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie

Kośko A, Szmyt M. 2004. Hodowla w systemach gospodarki Niżu: IV−III tys. BC (kultury: pucharów lejkowatych i amfor kulistych). In Kośko A, M. Szmyt M (eds.). Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru (neolit, eneolit, epoka brązu). Archaeologia Bimaris – Dyskusje 3. Poznań: Wydawnictwo Poznańskie. Pp. 103−115

Kośko A, Szmyt M. 2006. Opatowice – Wzgórze Prokopiaka I. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej I. Poznań: Wydawnictwo Poznańskie

Kośko A, Szmyt M. 2007a. Opatowice – Wzgórze Prokopiaka II. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej II. Poznań: Wydawnictwo Poznańskie

Kośko A, Szmyt M. 2007b. Opatowice – Wzgórze Prokopiaka III. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej III. Poznań: Wydawnictwo Poznańskie

Kośko A, Sikorski A, Szmyt M. 2010. ‘Cord’ and ‘cord−like’ ornaments on the pottery of Funnel Beaker Culture societies on the Polish Lowlands in the 4th Millennium BC. In Kośko A, Szmyt M (eds.). ‘Cord’ ornaments on pottery in the Vistula and Dnieper interfluvial region: 5th – 4th Mill. BC. Baltic−Pontic Studies 15. Pp. 146−152

Kośko A, Szmyt M (eds.). 2010. ‘Cord’ ornaments on pottery in the Vistula and Dnieper interfluvial region: 5th – 4th Mill. BC. Baltic−Pontic Studies 15

Koszałka J. 2007. Odciski roślinne na ceramice i polepie kultury pucharów lejkowatych oraz kultury amfor kulistych. In Kośko A, Szmyt M (eds.). Opatowice – Wzgórze Prokopiaka III. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej III. Poznań: Wydawnictwo Poznańskie. Pp. 363−369

Langer JJ, Pietrzak S, Tomaszewska A, Kamińska M, Kośko A, Szmyt M. 2007. Substancje smoliste na ceramice kultury pucharów lejkowatych. In Kośko A, Szmyt M (eds.). Opatowice – Wzgórze Prokopiaka III. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej III. Poznań: Wydawnictwo Poznańskie. Pp. 339−357

Machnik J. 2009. Short and long−distance pastoral journeys along ancient upland routes in Europe in the 4th–4th/3rd Millennium BC. In Kośko A, Kločko VI (eds.). Routes between the

seas: Baltic−Bug−Boh−Pont from the 3rd to the middle of the 1st millennium BC. Baltic−Pontic Studies 14. Pp. 214−222

Makohonienko M. 2008. Szata roślinna i etapy rozwoju krajobrazu kulturowego Kujaw w rejonie Pagórków Radziejowskich w okresie neolitu i epoce brązu. Podstawy palinologiczne. In Bednarczyk J, Czebreszuk J, Makarowicz P, Szmyt M (eds.). Na pograniczu światów. Studia z pradziejów międzymorza bałtycko−pontyjskiego ofiarowane Profesorowi Aleksandrowi Kośko w 60. rocznic urodzin. Poznań: Wydawnictwo Poznańskie. Pp. 353−370

Makowiecki D, Makowiecka M. 2000. Gospodarka zwierzętami społeczności kultury pucharów lejkowatych (grupy: wschodnia i radziejowska) oraz kultury amfor kulistych. In Kośko A (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie. Pp. 347−378

Makowiecki D. 2003. Historia ryb i rybołówstwa w holocenie na Niżu Polskim w świetle badań archeoichtiologicznych. Poznań: Instytut Archeologii i Etnologii Polskiej Akademii Nauk

Makowiecki D. 2009. Gospodarka zwierzętami w mikroregionie Żuławki Małej, gm. Wyrzysk. In Rola J (ed.). Późnoneolityczny węzeł komunikacyjny w strefie środkowej Noteci (Żuławka Mała, gmina Wyrzysk). Poznań: Wydawnictwo Poznańskie. Pp. 125−138

Marciniak A. 2005. Placing animals in the Neolithic. Social zooarchaeology of prehistoric farming communities. London: UCL Press

Mazurowski RF. 1983. Bursztyn w epoce kamienia na ziemiach polskich. Materiały Starożytne i Wczesnośredniowieczne V: 7−130

Mazurowski RF. 1999. Exploitation and working on amber during the late Neolithic period in Żuławy region. In: Kosmowska−Ceranowicz B, Paner H (eds.). Investigations into Amber. Gdańsk: The Archaeological Museum in Gdańsk, Museum of the Earth, Polish Academy of Sciences. Pp. 121−129

Migal W. 1997. Selected aspects of specialization in mining and flint knapping. In Schild R, Sulgostowska Z (eds.). Man and flint. Warsaw: Institute of Archaeology and Ethnology, Polish Academy of Sciences. Pp. 99−101

Migal W. 2006. About the variability of reduction sequences of the Globular Amphora Culture. In Körlin G, Weisgerber G (eds.). Stone Age – Mining Age. Deutsches Bergbau−Museum Bochum. Der Anschnitt, Beiheft 19: 523−530

Nalepka D. 2005. Late Glacial and Holocene palaeoecological conditions and changes of vegetation cover under early farming activity in the south Kujawy region (Central Poland). Acta Palaeobotanica. Supplementum 6. Kraków: Polish Academy of Sciences, W. Szafer Institute of Botany

Pelisiak A, Rybicka M, Ralska−Jasiewiczowa M. 2006. From the Mesolithic to Modern Times. Settlement organization and economy recorded in annually laminated sediments of the Lake Gościąż (Central Poland). Collectio Archaeologica Ressoviensis 2. Rzeszów: Fundacja Rzeszowskiego Ośrodka Archeologicznego, Instytut Archeologii Uniwersytetu Rzeszowskiego

Pietrzak S. 2010. Zastosowanie i technologie wytwarzania dziegciu przez społeczeństwa międzyrzecza Dniepru i Łaby od VI do II tysiąclecia BC. Poznań: Wydawnictwo Poznańskie

Pospieszny L. 2009. Zwyczaje pogrzebowe społeczności kultury ceramiki sznurowej w Wielkopolsce i na Kujawach. Poznań: Wydawnictwo Poznańskie

Prinke A. 1983. Surowce kamienne. In Kozłowski JK, Kozłowski SK (eds.). Człowiek środowisko w pradziejach. Warszawa: Państwowe Wydawnictwo Naukowe. Pp. 127−135

Prinke D. 1991. Siedlung der Trichterbecherkultur in Chaławy, Gem. Brodnica, Woj. Poznań, Fundstelle 15. In Jankowska D (ed.). Die Trichterbecherkultur. Neue Forschungen und Hypothesen, Teil II. Poznań: Instytut Prahistorii Uniwersytetu im. Adama Mickiewicza w Poznaniu, Zakład Archeologii Wielkopolski IHKM PAN w Poznaniu. Pp. 143−148

Prinke D. 2010. Osadnictwo ludności kultur wstęgowych i kultury pucharów lejkowatych na stanowisku 1 w Głuchowie, woj. wielkopolskie. Fontes Archaeologici Posnanienses 46: 43−105

Przybył A. 2009. Społeczności późno neolitycznej kultury pucharów lejkowatych na Kujawach. Problem wpływów z kręgu kultury badeńskiej. Materiały do syntezy pradziejów Kujaw 13. Poznań: Wydawnictwo Poznańskie

Pyzel J. 2010. Historia osadnictwa społeczności kultury ceramiki wstęgowej rytej na Kujawach. Gdańskie Studia Archeologiczne. Seria Monografie1. Gdańsk: Instytut Archeologii Uniwersytetu Gdańskiego

Ralska−Jasiewiczowa M, Goslar T, Madeyska T, Starkel L. 1998 (eds.). Lake Gościąż, Central Poland. A monographic study. Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences

Rola J. 2009. Późnoneolityczny węzeł komunikacyjny w strefie środkowej Noteci (Żuławka Mała, gmina Wyrzysk). Poznań: Wydawnictwo Poznańskie

Rzepecki S. 2004. Społeczności środkowoneolitycznej kultury pucharów lejkowatych na Kujawach. Materiały do syntezy pradziejów Kujaw 12. Poznań: Wydawnictwo Poznańskie

Sobociński M, Makowiecki D. 1991. Current state of knowledge of archaeozoological materials of the Globular Amphorae culture. In Cofta−Broniewska A (ed.). New tendencies in studies of Globular Amphorae Culture. Archaeologia Interregionalis 14. Warsaw: Warsaw University, Jagiellonian University Cracow. Pp. 145−153

Stępnik T. 2006. Identyfikacja taksonomiczna węgli drzewnych z obiektów wziemnych. Podstawy oceny funkcjonalnej. In Kośko A, Szmyt M (eds.). Opatowice – Wzgórze Prokopiaka I. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej I. Poznań: Wydawnictwo Poznańskie. Pp. 265−268

Stępnik T. 2007a. Identyfikacja taksonomiczna węgli drzewnych. In Kośko A, Szmyt M (eds.). Opatowice – Wzgórze Prokopiaka II. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej II. Poznań: Wydawnictwo Poznańskie. Pp. 249−255

Stępnik T. 2007b. Identyfikacja taksonomiczna węgli drzewnych. In Kośko A, Szmyt M (eds.). Opatowice – Wzgórze Prokopiaka III. Studia i materiały do badań nad późnym neolitem Wysoczyzny Kujawskiej III. Poznań: Wydawnictwo Poznańskie. Pp. 371−373

Stępnik T. 2009. Groble z Żuławki Małej w świetle analizy dendrologicznej. In Rola J (ed.). Późnoneolityczny węzeł komunikacyjny w strefie środkowej Noteci (Żuławka Mała, gmina Wyrzysk). Poznań: Wydawnictwo Poznańskie. Pp. 119−125

Szczurek T. 1981. Osada młodszej kultury pucharów lejkowatych w Gorzowie (stanowisko 10). In Wiślański T (ed.). Kultura pucharów lejkowatych w Polsce. Poznań: Polska Akademia Nauk Oddział w Poznaniu, Leszczyńskie Towarzystwo Kulturalne w Lesznie. Pp. 161−170

Szmyt M. 1993. Pottery. In Kobusiewicz M, Kabaciński J (eds.). Chwalim. Subboreal hunters−gatherers of the Polish Plain. Poznań: Institute of Archaeology and Ethnology Polish Academy of Sciences. Pp. 61−72

Szmyt M. 1996. Społeczności kultury amfor kulistych na Kujawach. Materiały do syntezy pradziejów Kujaw 6. Poznań: Uniwersytet im. Adama Mickiewicza

Szmyt M. 2000. Osadnictwo ludności kultury amfor kulistych. In Kośko A (ed.). Archeologiczne badania ratownicze wzdłuż trasy gazociągu tranzytowego. Tom III. Kujawy. Część 4. Osadnictwo kultur późnoneolitycznych oraz interstadium epok neolitu i brązu: 3900−1400/1300 przed Chr. Poznań: Wydawnictwo Poznańskie. Pp. 135−329

Szmyt M. 2002. Kugelamphoren−Gemeinschaften in Mittel− und Osteuropa: Siedlungsstrukturen und soziale Fragen. In Müller J (ed.). Vom Endneolithikum zur Frühbronzezeit: Muster sozialen Wandels? Universitätsforschungen zur Prähistorischen Archäologie 90. Bonn: Habelt. Pp. 195−234

Szmyt M. 2004. Wędrówki bliskie i dalekie. Ze studiów nad organizacją społeczną i gospodarką ludności kultury amfor kulistych na terenie

Europy Środkowej i Wschodniej. In Kośko A, Szmyt M (eds.). Nomadyzm a pastoralizm w międzyrzeczu Wisły i Dniepru (neolit, eneolit, epoka brązu). Archaeologia Bimaris – Dyskusje 3. Poznań: Wydawnictwo Poznańskie. Pp. 117−136

Szmyt M. 2006. Dead animals and living society. Jungsteinsite, 15. December 2006. Kiel. accessed on 15/11/2012 <http://www.jungsteinsite.de>

Szmyt M. 2008. Baden patterns in the milieu of Globular Amphorae: Transformation, incorporation and long continuity. A case study from the Kujavia region, Polish Lowland. In Furholt M, Szmyt M, Zastawny A (eds.). The Baden complex and the Outside World. Studien zur Archäologie in Ostmitteleuropa/Studia nad Pradziejami Europy Środkowej 4. Kiel: Habelt. Pp. 217−231

Szmyt M. 2010. Osadnictwo ludności kultury amfor kulistych na stanowisku 1 w Głuchowie, woj. wielkopolskie. Fontes Archaeologici Posnanienses 46: 183−192

Szmyt M. 2011. Kurhany w kulturze amfor kulistych. Dwa przykłady z Kujaw. In Kowalewska−Marszałek H, Włodarczak P (eds.). Kurhany i obrządek pogrzebowy w IV−II tysiącleciu p.n.e. Kraków, Warszawa: Instytut Archeologii i Etnologii Polskiej Akademii Nauk, Instytut Archeologii Uniwersytetu Warszawskiego. Pp. 119−132

Tetzlaff W. 1981. Osada kultury pucharów lejkowatych w Mrowinie, woj. poznańskie. In Wiślański T (ed.). Kultura pucharów lejkowatych w Polsce. Poznań: Polska Akademia Nauk Oddział w Poznaniu, Leszczyńskie Towarzystwo Kulturalne w Lesznie. Pp. 171−188

Tetzlaff W. 1988. Ratownicze badania wykopaliskowe osady kultury pucharów lejkowatych w Śremie, woj. poznańskie. Fontes Archaeologici Posnanienses 36: 37−43

Tetzlaff W. 1989. Funnel Beaker Culture. Mrowino. Przegląd Archeologiczny 36: 247−249

Tetzlaff W. 1991. Siedlung der Trichterbecherkultur in Śrem, Woj. Poznań, Fundstelle 8. In Jankowska D (ed.). Die Trichterbecherkultur. Neue Forschungen und Hypothesen, Teil II. Poznań: Instytut Prahistorii Uniwersytetu im. Adama Mickiewicza w Poznaniu, Zakład Archeologii Wielkopolski IHKM PAN w Poznaniu. Pp. 149−153

Wasylikowa K. 1993. History of vegetation. In Kobusiewicz M, Kabaciński J (eds.). Chwalim. Subboreal hunters−gatherers of the Polish Plain. Poznań: Institute of Archaeology and Ethnology Polish Academy of Sciences. Pp. 91−101

Winiarska−Kabacińska M. 2010. Analiza funkcjonalna materiałów krzemiennych ze stanowisk kultury pucharów lejkowatych i kultury amfor kulistych z terenu Kotliny Toruńsko−Bydgoskiej. Fontes Archaeologici Posnanienses 46: 183−192

Wirska−Parachoniak M. 1983. Surowce ceramiczne. In Kozłowski JK, Kozłowski SK (eds.). Człowiek środowisko w pradziejach. Warsaw: Państwowe Wydawnictwo Naukowe. Pp. 136−140

Wiślański T. 1966. Kultura amfor kulistych w Polsce północno−zachodniej. Wrocław: Ossolineum

Wiślański T. 1969. Podstawy gospodarcze plemion neolitycznych w Polsce północno−zachodniej. Wrocław: Ossolineum